

# AÉRODYNAMICAL EXPERIMENTS AND OBSERVATIONS IN RUSSIA.

THE results of an extensive series of experiments upon the resistance of various forms of bodies in a current of air, as well as the particulars relating to various balloon ascents and observations upon the

and subsequently the velocity for each experiment was obtained from the number of revolutions of the fan.

The weak point of this method is that the body which is being experimented upon in the tube presents an obstacle to the free motion of the air, and therefore reduces the velocity, and furthermore, the walls of the tube exert an unknown influence upon the result excepting for quite small bodies placed near the centre. With a similar arrangement at the National Physical Laboratory, Mr. Stanton found that, working with a tube of 2 feet diameter, he could not experiment upon a pressure plate of more than 2 inches diameter without finding that his results were vitiated by the influence of the walls of the tube.

It is impossible in a brief notice to give an account of all the experiments; perhaps the most important are those showing the increased lifting power which a screw possesses when a current of air is made to blow at right angles to its axis. Thus the lifting power with a horizontal current of 20 feet per second was found to be more

than twice as great as with still air, although the driving power required was not increased.

Details of the methods and results of four ascents of unmanned balloons are given, and it is noteworthy that in a country like Russia the instruments should be so often recovered.

height of clouds, are given in two publications recently received from the Institut aérodynamique de Koutchino.<sup>1</sup> The institute (Fig. 1) was founded for the purpose of studying air resistance and for the scientific exploration of different layers of the atmosphere. Besides the director and honorary members of the staff, there are in all twenty-one men employed, of whom six are labourers.

The buildings and equipments cost 100,000 roubles. There is a dwelling house for the staff, a hall, 100 feet by 43 feet by 28 feet, for experimental work, and suitable workshops and tools.

The experiments upon air resistance were made in a long cylindrical tube 48 feet long and 4 feet diameter, shown in Fig. 2 (a piece of the tube is temporarily removed to show the position of a small screw inside). The air current in this tube is produced by an electric fan, the power coming in the first place from a thirty horse-power steam engine. It was found at first that the air current in the tube was not uniform, and was not even symmetrical about the axis of the tube, since greater proximity to the floor and one wall of the building produced a disturbing effect. This difficulty was overcome by inserting the end of the tube into a large cylinder 7 feet diameter and 12 feet long. The velocity of the air in the tube was carefully measured for various speeds of the fan,

<sup>1</sup> Institut aérodynamique de Koutchino. (St. Petersburg, 1905.) Bulletin de l'Institut aérodynamique de Koutchino, Fascicule I (St. Petersburg: Golické and Wiliborg, 1905.)

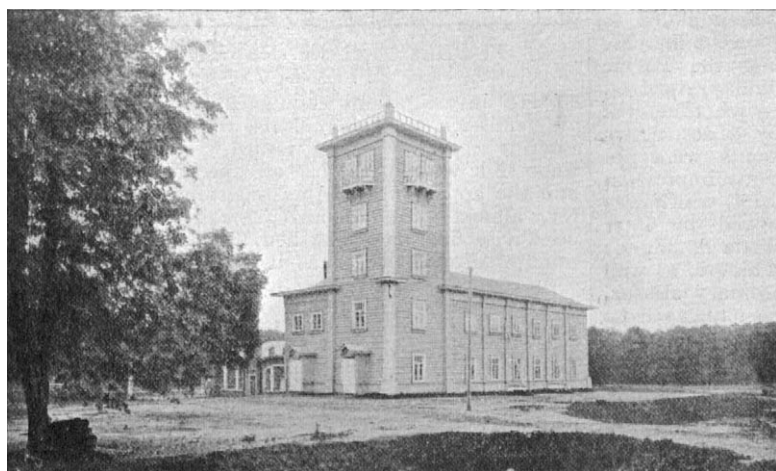


FIG. 1.—The Aërodynamic Institute at Koutchino.

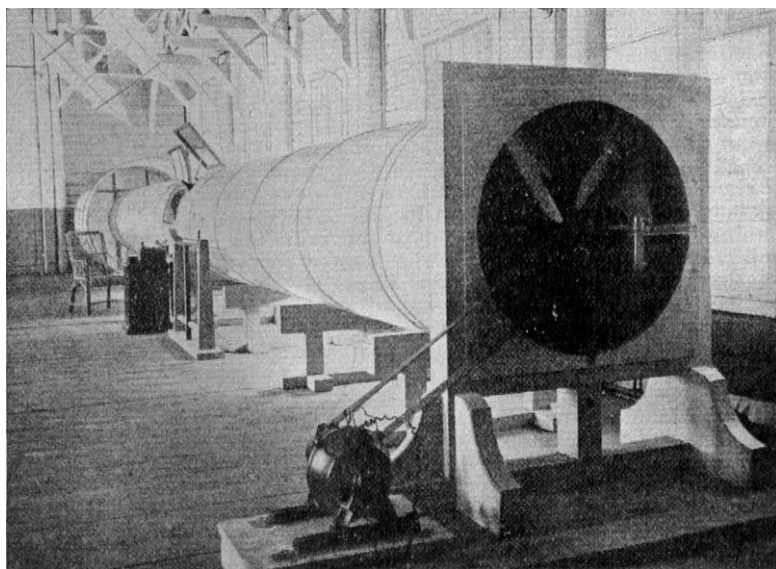


FIG. 2.—Tube for Experiments on Air Resistance at the Aërodynamic Institute, Koutchino.

The observations on clouds depend on the use of an electric search-light, and the observation, by a theodolite in the neighbourhood, of the position of the patch of lighted cloud. Unfortunately, the method can only be pursued at night, when the type of cloud is not very easy to determine.

The whole account will well repay a careful perusal, and anyone engaged on the design of a flying machine will find much useful information in the results of the various experiments on bodies rotating in a current of air.

### THE MEXICAN EARTHQUAKE.

ANOTHER great earthquake has been added to the series which has marked the recent increase in seismic and volcanic activity along the Pacific coast of America. At 11.30 p.m. on Sunday, April 14, or about 6 a.m. of April 15 by Greenwich time, the greater part of Mexico was visited by a destructive earthquake. As usual, the first accounts were not only exaggerated, but gave an erroneous impression of the distribution of damage; Mexico city, which was represented as almost destroyed, proved by later accounts to have been comparatively little damaged; while the towns of Chilpancingo and Chilapu, as well as some others not to be found in ordinary atlases, suffered great destruction. The sea-coast towns from Salina Cruz to Acapulco suffered severely, and a portion of the latter is said to have been submerged. The shock is reported as severe at San Luis Potori and Juan Batista, though no damage was done at either place; these two cities are about 530 miles apart and about 350 miles from the region of greatest damage, so we may estimate the area over which the shock was sensible as extending to somewhere about 500 miles from the centre of the disturbance.

The earliest reports stated that railway communication between Mexico city and Vera Cruz was suspended owing to the sinking of the permanent way, but this news, which has not been corroborated in later telegrams, is the only suggestion that the focus of the earthquake may have extended to any distance from the west coast. Everything else points to the conclusion that it originated close to the shore-line of the Pacific, and was partly, if not wholly, submarine. Sea-quakes are common in this region; sometimes they are felt by ships at sea though unnoticed on shore, and in at least one instance seem to have caused the loss of a ship. The story is a remarkable one. On October 3, 1902, the German barque *Freya* cleared from Manzanillo for Panta Arenas; nothing more has been heard of the captain or crew, but the ship was found, twenty days later, partially dismantled and lying on its side. There was nothing to explain the condition of the ship, but a wall calendar in the captain's cabin showed that the catastrophe must have overtaken it on October 4, not long after leaving port, as was also indicated by the anchor being found still hanging free at the bow. Weather reports show that only light winds were experienced in this region from October 3 to October 5, but, on the other hand severe earthquakes were felt at Acapulco and Chilpancingo on October 4 and 5, one of which probably caused the damage to the *Freya* which led to its abandonment.

Prominence has been given in the daily papers to earthquakes in Spain and Italy, which occurred shortly after the Mexican one; but they were of an order the occurrence of which is too frequent to justify any direct connection between them and the greater one. It may be different as regards the other two large earthquakes, which were registered at 9.10 p.m. on April 18, and at oh. 11 a.m. on April 19; no news of these shocks has yet reached us; they must have been earthquakes of the first order of importance, but are only known from distant records, which are interpreted as showing that they originated at about 90° from western Europe. This is about the distance of Mexico, but it is rare for after-

shocks to be of as great magnitude as these; on the other hand, it is not uncommon for earthquakes to take place in groups, usually originating at nearly opposite points in the globe. We may consequently, in the absence of news of a great earthquake in America or Japan, look for the origin of these two earthquakes in the North Pacific Ocean on the eastern part of the Malay Peninsula.

### TUBERCULOSIS RESEARCH AND VIVISECTION.

THE investigations conducted by the Royal Commission on Tuberculosis, contained in a second interim report recently issued,<sup>1</sup> would have been impossible without the use of experiments on animals, and the appearance of this report is most opportune, for, almost simultaneously, the Royal Commission on Vivisection has published the first volume of the minutes of evidence taken before it.

As regards the investigations on tuberculosis, thirty different viruses isolated from cases of tuberculosis occurring spontaneously in bovines have been studied, and the results of introducing them into a number of different animals by feeding and by inoculation are recorded. In calves, inoculation usually results in generalised progressive tuberculosis, but the effect is somewhat dependent on the dose, *i.e.* the number of bacilli, administered. Feeding, on the other hand, usually produces lesions limited to the neighbourhood of the digestive tract, which generally retrogress and become calcareous. The bovine bacillus, when introduced into rhesus monkeys or chimpanzees either by inoculation or by feeding, induces rapid generalised tuberculosis, and considering the close relation that exists between the anthropoid apes and man, these results are of the highest importance. In pigs generalised progressive tuberculosis is readily set up both by feeding with, and by the inoculation of, bovine bacilli. Goats, dogs, and cats are relatively less susceptible, but more or less tuberculous infection can similarly be produced in them. On this part of the investigation the commissioners remark that the bacillus of bovine tuberculosis is not so constituted as to act on bovine tissues only, and the fact that it can readily infect the anthropoid apes, and, indeed, seems to produce this result more readily than in the bovine body itself, has an importance so obvious that it need not be dwelt on.

The viruses isolated from sixty cases of the disease in man have also been studied, and the results obtained show that they may be divided into two groups, subsequently referred to as group i. and group ii. The bacilli of group i. were mostly obtained from cases of abdominal tuberculosis occurring in children, and the results produced by introducing them into animals are identical with those produced by the bovine bacillus. The bacilli of group ii., obtained from various forms of human tuberculosis, grow more luxuriantly in culture than those of group i., and inoculated into calves and rabbits do not produce the generalised and fatal disease caused by the bovine bacillus, but in rhesus monkeys and in the chimpanzee set up a general tuberculosis. Certain human viruses, differing in certain respects from those of groups i. and ii., were also met with, and are classed as group iii., but an opinion on their significance is reserved for a future report.

The commissioners conclude that the tubercle bacillus in its nutritive and reproductive powers re-

<sup>1</sup> Second Interim Report of the Royal Commission appointed to inquire into the Relations of Human and Animal Tuberculosis, Part i., Report. Part ii., Appendix. Vol. iv., "Comparative Histological and Bacteriological Investigations." By Dr. Arthur Eastwood.